BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

COLUMBIA, SOUTH CAROLINA

COMMISSON MEETING MARCH 30, 2011 2:00 P.M.

MEMBERS PRESENT: John E. 'Butch' HOWARD, *CHAIRMAN,* David A. WRIGHT, *VICE CHAIRMAN*; and COMMISSIONERS G. O'Neal HAMILTON, Randy MITCHELL, Swain E. WHITFIELD, and Nikiya 'Nikki' HALL
ADVISOR TO COMMISSION: Joseph Melchers, Esq.

STAFF: F. David Butler, Jr., Senior Counsel; James Spearman, Ph.D., Executive Assistant to the Commissioners; B. Randall Dong, Esq., Josh Minges, and Rebecca Dulin, Esq., Legal Staff; Phil Riley, Tom Ellison, Doug Pratt, and William O. Richardson, Advisory Staff; Janice Schmieding, Docketing Staff; Jo Elizabeth M. Wheat, CVR-CM-GNSC, Court Reporter; and Patty Sands, Commission Meeting Assistant
.

TRANSCRIPT OF PROCEEDINGS

ADMINISTRATIVE AGENDA [ITEM 1]

E X C E R P T – A D M I N I T E M 1

[2:10 P.M.]

VICE CHAIRMAN WRIGHT: It's yours.

MR. GENOA: Well, Chairman Howard, Commissioners, thank you very much for this opportunity. I really appreciate the fact that you've reached out to the Nuclear Energy Institute, and I'm very happy to come and brief you on what we have learned of the nuclear accident in Japan and the actions that not only the industry but our regulator, the Nuclear Regulatory Commission, will take going forward.

Let me just stress that the Nuclear Energy Institute in conjunction with our member companies have been striving to provide factual, credible information to policymakers since this event occurred, and we will continue to do that. I appreciate the opportunity to continue. We've been collecting that information directly from TEPCo, Tokyo Electric Power Company, the owner of the Fukushima reactor site; also from the Japanese Atomic Industrial Forum, which is essentially the equivalent organization to NEI in Japan, it's a sister agency you may say; the Japanese Electric Association; US Department of Energy; the US

Nuclear Regulatory Commission; along with other organizations and companies. So we've been trying to pull that together, and it's been on our website every day, three times a day, since the accident occurred on March 11.

In addition, the Institute of Nuclear Power Operations -- you may know that organization was set up after our accident, Three Mile Island -- is working through its international affiliate, the World Association of Nuclear Operators, to get information on the ground in a technical way and get it out, not only to NEI but to the industry, so that we can apprise ourselves of what is happening there and learn from it.

Before I continue, I can't say enough about the courage and determination of the personnel working at the Fukushima site. They may not even know the status of their families and loved ones today; their homes are likely washed away. And yet, they labor on to protect the public health and safety there in Japan. Our thoughts and prayers are with them, and our industry is reaching out with technical support and materials being collected through the Institute of Nuclear Power Operations, things like protective clothing,

respirators, radiation-detection instrumentation, consumable materials, and so forth. That's all being shipped to Japan in coordination with INPO.

So, let's see if I can do this [indicating].

[Reference: PowerPoint Slide 1-2]

Well, just to begin, let me take you back to Friday, March 11, before the earthquake. Japan has the third largest commercial nuclear program in the world. They have 54 operating reactors. Approximately 30 percent of their electricity is generated from nuclear power. This is largely because Japan really lacks significant fossil fuel resources. They had no coal, no oil, no natural gas, and so they made a large commitment to nuclear power and they have a large commitment going forward.

TEPCo, the owner of the Fukushima site, provides about 27 percent of Japan's electricity, and right now one of the biggest challenges they face is that loss of generation that's occurred. Over 12,000 megawatts of nuclear energy was shut down when that earthquake occurred. Much of that is coming back, but some will not for a long time.

[Reference: PowerPoint Slide 3]

This is the site, as you see it. There are

six units; three were operating, Units 1, 2, and 3. Units 4 and 5 and 6 off to the far right were in an extended outage. They had been shut down -- most recently, Unit 4 shut down about 110 days before the event -- for maintenance. The Japanese have very extended maintenance programs. They don't do the kind of on-line maintenance that we do here in the States, although they are trying to understand how we do it, to improve their capacity factors.

But they're all boiling water reactors, and the Units 5 and 6 really didn't sustain any damage, so it's really Units 1 through 4 that I want you to focus on. Again, 1 through 3 were operating, and 4, 5, and 6 were not. They all have what's called a Mark I containment -- and I'll show you a picture of that in a moment.

The three plants that were operating shut down. In total, 11 shut down immediately when the earthquake occurred. They shut down as they were supposed to in response to an earthquake. Their emergency diesels came up when they lost off-site power. Those diesels that provide electricity to the site were pumping cooling water to the reactors so that they could move into a safe shutdown situation. But within an hour, a huge tsunami hit

that site.

The tsunami -- both the earthquake and tsunami exceeded expectations, but the plant seemed to handle the earthquake fine but the tsunami took out that entire section out in front you see behind the barriers there [indicating]. That's where all the cooling water intakes are for the structure. Nuclear safety cooling and other important support equipment for the plant was washed away. In some cases, the diesel generators then failed or stopped operating based on high temperature. They need coolant just like your car. If you would lose your radiator hose, you know that your engine would overheat. These diesels are set up to shut down automatically so they don't damage themselves, but without cooling water -- in some cases the fuel tanks were also washed away by the tsunami. They were completely in a station blackout at that point. They did have battery power for eight to nine hours, to handle some things, but at this point, things were very problematic for the operators there.

With the cooling flow to those Reactors 1, 2, and 3 cut off, the decay heat in the fuel from the fission process continued to accumulate, eventually

boiling the water to steam. Once the water level was actually removed or fell below the surface of the fuel, the fuel begins to heat up rapidly, and in a very high-temperature situation like that in the presence of steam environment, there's a reaction between the fuel cladding -- we talk about the metal fuel cladding around the uranium pellets; it's made of zirconium. That zirconium reacted in that high-temperature environment to produce hydrogen gas. Now, as that steam bubble builds up -- and I guess I could shift now to the next picture so you can see it more clearly.

[Reference: PowerPoint Slide 4]

Let me just lay out this design. This is a Mark I containment. This yellow that you see around the core, around the reactor itself, is the primary containment for this boiling water type reactor. All of this area above -- below this area [indicating] is the main portion of the plant, and the yellow is what we call the primary containment. This doughnut-shaped area, the suppression pool, or torus, is where the high-energy steam would be discharged after an accident, into that torus to be further cooled. That allows you to depressurize the reactor, depressurize the containment. But as

that heat continues to build up, you must vent that so you can continue to put cooling water in. At first, they were using seawater, pumping in with fire pumps in Units 1, 2, and 3.

So periodically they would have to vent the steam. With that, as the fuel heated up, they vented some radioactive gases, as well. All of that venting would first go into this outer containment structure, after it comes out of the torus, but even that would build up. Normally, that would be cooled, as well. And eventually, they had to vent high-pressure steam, gas, and hydrogen now that had built up from the damaged fuel into this upper area here [indicating] which we call the reactor building or secondary containment.

It is at this time that some ignition source ignited the hydrogen. Of course, they're having several hundred tremors after this. Metal is being knocked around. It's not clear what ignited it, but a hydrogen explosion occurred in Unit 1, later in Unit 3. A day later in Unit 2, there was another small hydrogen explosion, we believe somewhere in this torus area [indicating]. Units 1 and 2, although those explosions -- and you've

seen the pictures -- literally blew all the sheet metal off the top of this building, this is above the concrete that surrounds the main containment. And you should understand that these metal buildings are actually designed in a tornado or severe depressurization to actually blow out the panels rather than direct the energy down into the core. So with an explosion like that, it's not unexpected.

We are not sure if the Japanese had hydrogen mitigation equipment. Of course, after Three Mile Island, we learned about hydrogen in the United States. The Nuclear Regulatory Commission required all US plants to deal with hydrogen, to adapt their plants. And the 23 plants in the United States that share this containment design have what we call hardened vent pipes that actually would vent that gas/steam mixture away from the building, up the side, so that such an explosion wouldn't occur. But we don't yet know the exact design of the Japanese, and we're looking into that.

So again, Units 1, 2, and 3, we expect some fuel damage in this area [indicating]. Unit 1 and 3, severe damage to this part of the plant [indicating], blown up from the hydrogen explosion.

The important thing is this is where the fuel pool is [indicating], at reactor level so that they can just go ahead and move the fuel from the reactor into the pool. In Units 3 and 4, there may be fuel pool integrity concerns, because they've had to continue to add water to that, in excess of what you would expect from just the loss through evaporation. Those pools are cooled much like a swimming pool. It would have a filter and in some cases a heating system; well, in our case, it would be a cooling system. The water to make that up really could be as small as a garden hose, if you got it in there soon enough. It's not clear why they've had to put so much water in. So we're going to learn a lot, whether Units 3 and 4 actually were damaged.

I mentioned Unit 4. It's interesting because there was no fuel in the reactor, itself, and so if there was a hydrogen explosion, it was generated from damaged fuel in the fuel pool. There also were high radiation levels after that event, which leads us to believe that the fuel pool in Unit 4 and possibly 3 is damaged, and that some of that fuel may be damaged. 5 and 6 were not damaged.

So that's the downside of the equipment. And

let me just run through, again, where we think we are. All right.

[Reference: PowerPoint Slide 5]

That is pretty much the update on the accident and the immediate aftermath, and that summarizes that to a large degree. Let me just tell you where we are today.

So, we flash-forward to today. You've probably watched much of this as they have struggled heroically to continue to pump saltwater into Units 1, 2, and 3, to spray water into fuel pools in 3 and 4, and striving to get power back to the site. Well, today, all units have AC power restored to all six units. They have -- control rooms are lit up and they have power at all six units at this time.

Cooling water at Units 1, 2, and 3 are now switched to freshwater. This is to continue cooling and also to prevent a further buildup of salt in the reactor, which, as you know, will be corrosive.

Of course, at least three reactors will never operate again. 4, unlikely. 5 and 6 certainly could.

It's important to realize that the public was

evacuated from the site before any radiation releases occurred, and it's important to realize they had time to do this even subsequent to this huge tsunami and earthquake. So, without any transport infrastructure at all, they still were easily able to get their people away from the danger, and they did so. You also will hear that radioactive -- or, excuse me -- potassium iodine -- potassium iodine, right -- was administered to people that were staying within the sheltered area. They evacuated people out initially just a few kilometers, then they moved them out 20 kilometers, which is about 12-1/2 miles. Currently, there is voluntary evacuation beyond the 20 kilometers, or 12-1/2 miles, and that is a precautionary evacuation.

You have heard, of course, high radiation levels still are occurring in the Buildings 1, 2, and 3, and parts of 4. The workers are now dealing with radioactively contaminated water at the site, as they struggle to get power back. You know that radioactive materials, when we vented -- or, when they vented these reactors, basically small radioactive clouds, releases, would occur and would travel wherever the wind was at that time.

You've heard likely that there were controls on water, that iodine was identified in drinking water and they put controls on it, particularly for infants, that those are expected to come off quickly, that levels never reached the point where adults would have to avoid drinking it. Milk and some vegetables have been restricted. They found contamination in there. The levels were still not very high, but if you were to eat it over the entire course of a year, you would exceed levels that are considered safe, so they did a precautionary control on that.

The IAEA -- that's the International Atomic Energy Agency -- took 63 food samples between March 24th and 29th, and these were in eight provinces around the power plant. They were all below regulatory limits at this time, for radioactive iodine and caesium. There's new analysis of the seawater. You've heard reports that the seawater was contaminated in fairly high levels in very close to the plant. The analysis shows that a significant decrease in those levels occurred since March 26th, according to the IAEA.

Japan's National Research Institute and Fisheries Science Group has analyzed fish samples

around the prefecture; they are far below any concern for fish consumption. Four out of five showed no contamination; one was just detectable. The IAEA said that the situation is evolving, and that you would expect the concentrations in radio-nuclei in seawater to drop lower through dilution, and that levels in marine food would most likely not reach levels above regulatory limits. But they cautioned that this will change as plant conditions continue to pump water around in the site.

You probably heard yesterday, or maybe it was the day before, about plutonium found at the site. The plutonium that was found and sampled was not atypical of what you might find here in South Carolina from atmosphere testing of weapons back in the '50s and '60s. And so while they have analyzed this and found that it most likely is from the reactors, it is at a level that is very low. In fact, you would have to eat or ingest an awful lot of dirt -- over a kilogram -- and still would get a trivial dose. So that was a little bit of sensationalism. I'm sure you're not surprised.

But, so let me step back. I've just given you the gruesome details of the worst accident that we can imagine in the type of power plant that is

operated in the United States and around the world. This is not a Chernobyl situation, and never will be. That's a totally different scenario.

But the big picture: The entire region was devastated by one of the top ten earthquakes in recorded history, and a massive tsunami, both above the design capacity. More than 11,000 Japanese are dead. More than 16,000 are missing and likely dead. The only things left standing were the nuclear plants. Everything was washed away. Now, even with heroic efforts, those plants were seriously destroyed because of the loss of off-site power.

That said, here's the current tally: One fatality. Wasn't even at this site; it was another site, likely a heart attack. 23 injured. Two missing. All those 23 that were injured that were hospitalized have been released from the hospitals. There were 19 exposures of emergency workers, all above ten rem. In the United States, five rem is the allowable limit for an occupational worker at a nuclear power plant. In years past, I received nearly five rem in several years when I worked in the power plants. These workers received two and three times that limit, but were below the limit of

25 rem that's allowed during accidents both in the United States and in Japan. So these are serious but unlikely to cause health effects later in life.

Again, the public was removed from the hazard in advance, so it's unlikely we're going to see a significant, or perhaps any, impact on public health and safety from the event, as tragic as it is.

So with that, let me shift to the United States.

[Reference: PowerPoint Slide 6]

As you know, last week President Obama talked to the nation about the emergency and its concern, and tried to reassure the public that our plants are safe, that they are necessary going forward, and that the disaster in Japan will not affect Americans on American soil or territories.

This was followed up, as well, by the Nuclear Regulatory Commission Chairman Jaczko, who actually is probably in front of Congress right now saying it again, and US Secretary of Energy Steven Chu.

As far as radioactive material in the United States, it is true that we can now detect radioactive material -- specifically, iodine -- from Japan in the United States, but that is only

because we have extraordinary ability to measure at very, very low levels. And it's not just the industry that has the capability; our Government does, as well.

[Reference: PowerPoint Slide 7]

But the fact that you can detect something, really at the atomic level, does not equate to harm. And both the DOE and the EPA have tried to reach out and confirm that these radiation levels will not harm individuals in the United States, as have the Centers for Disease Control and the Nuclear Regulatory Commission.

So the public should be unconcerned about the direct impact on Americans from this accident. Again, I don't believe that the bulk of the Japanese will be affected by this, other than the workers themselves -- and I, frankly, don't think they will be affected from the radiation, or at least -- but it's not done yet, and this cleanup will go on for quite some time

[Reference: PowerPoint Slide 8]

Now I mentioned they were able to evacuate their people, which is what we would do if there were an emergency, as well. At every nuclear power plant in the United States, there's an emergency

planning zone that allows us to inform the public to take protective actions if it's warranted. We do that based on plant conditions, not on actual releases. So we would move them out if there was a danger to the plant. I think you all know that we do this -- every year we train, and every other year we have a graded exercise, and that is with not only state officials -- who ultimately have the final say on whether there's an evacuation or sheltering; that decision is made by the governor, not by the industry.

But we do have the ability to go beyond ten miles, as is being done in Japan now, to monitor food, and to intervene in the sale of that food if it's warranted. That would likely be a temporary situation. I think it will be in Japan.

Finally, these emergency plan exercises are coordinated with Federal agencies such as the Nuclear Regulatory Commission and FEMA, part of Homeland Security, and it's part of an integrated national response plan that would be used for any type of a hazard.

[Reference: PowerPoint Slide 9]

This is just a pictorial to show the plant in the center, the two-mile radius around that plant

where you would take immediate action based on adverse conditions at the plant. You see that, in a downwind direction, in case there was a release, that's where the radioactive material -- you might choose to take advanced action. And then the ten-mile radius has been analyzed over and over, and been found to be adequate to handle anything expected in the United States, from a need to evacuate folks, but we have the capability to do it beyond that if necessary. And out to 50 miles, again, the ability to measure food and water and to take action, should that be warranted.

[Reference: PowerPoint Slide 10]

Now it's important to realize that these nuclear plants -- and we have 104 of them in this country -- are designed to handle earthquakes, floods, hurricanes, tornadoes -- and we look at the maximum credible event within 200 miles of the plant, and the plants are designed to meet that, with margin, with an adequate margin to prove to the Nuclear Regulatory Commission it's adequate. Of course, we're learning more about science all the time, and so the NRC is looking at earthquake seismic understanding, and of course, there will be a comprehensive review of the science and

requirements imposed on our plants.

Our plants are designed, as you can imagine, for both the loss of off-site and on-site power. I will tell you that after 9/11 we understood -- excuse me -- after Three Mile Island, we learned about hydrogen and its impact, and the NRC required us to adapt our plants and our procedures to deal with hydrogen so we could avoid explosions and manage that. We also learned through probabilistic safety assessment, or PRA, that a loss of off-site power -- on-site and off-site -- station blackout, is one of the critical challenges to these designs, and so we've been required by our regulator to adapt procedures and protocols to keep the fuel safe both in the reactor and the pool even in a loss-of-power situation.

After 9/11, we realized that bad things can happen. We had to design our plants to handle the loss of large areas from airplane impacts, jet fuel fires, explosions, and so forth, again, the goal being how would we get -- these are way beyond design-basis accidents, but how would we respond in that situation. How would we get cooling water to both the reactor and the fuel pools. And we have plans in place at every plant to do that, and of

course, we have to train on that. And as you know, we have a long history of using lessons learned, and sharing.

So let me tell you what we will do -- what we are already doing, to deal with that.

[Reference: PowerPoint Slide 11]

Of course, our Government has responded to Japan. We have people on the ground. The NRC chairman was there just yesterday. The Department of Energy has people on the ground. They also have assets, the ability to fly over these areas and take radiation readings, measurements, sample the environment. Our military is supplying freshwater in barges to the sites, so they can use freshwater. They're bringing in pumps and equipment to help.

The NRC has established a task force of senior NRC officials and retired NRC officials, bringing them out of retirement, to do a short-term and a long-term evaluation. They're required to give reports in 30, 60, and 90 days, and then they will do a six-month analysis of what we should do in the long term from what we've learned.

[Reference: PowerPoint Slide 12]

The industry, of course, didn't wait for the NRC to act. The industry, early last week,

collectively, unanimously, and voluntarily took action. Immediate short-term action, and agreed to longer-term action. The first short-term is to verify our readiness today to deal with beyond-design-base accidents, severe accident conditions.

I mentioned that we have requirements to do so, but those requirements go beyond our design basis. Everything in our design basis is analyzed by the NRC routinely, and so all of those preparations are under constant review. What we're doing now is going to those procedures and protocols, and verifying that they are ready to do the job, even in a severe beyond-design-basis situation.

In the long term, of course, we will be studying this accident, we will learn what was the root cause of the failures, what were their human faults, what are the differences between their reactors. Again, those reactors are the same as 23 of ours but over time ours have had to evolve with evolving NRC regulations. It's not clear to us yet what the Japanese have done. And we will incorporate all of this into our lessons, going forward.

Of course, plants that are being designed to

be built today, in large part, already have passive safety systems to deal with the loss of power that damaged these plants, and so, again, remember these are 30- and 40-year-old plants, and we have been designing to improve the safety in new plants ever since.

[Reference: PowerPoint Slide 13]

Here are the actions that every chief nuclear officer at every utility in the United States is doing, and some of this was done as early as last week: To verify each plant's capability to manage major accidents. Again, explosions, fires, the loss of a large part of the plant, plant equipment, to verify that we can manage a loss of off-site power. To verify that the equipment we would use to cool the water, to provide power, is not going to be impacted by floods, tsunamis, and that the material is safe. So they're actually going to walk it down, they're going to do checklists, make sure the equipment is there, and people are trained to operate it and know how to do it.

You may recall painfully during the Japanese event that there were times they had to wait to have equipment flown in, so they could pump water into various parts of the plant. Our plants all

have that staged right now. So now we're going to go out and verify it's there, verify it's operable, and we'll continue to do those walk-downs, going forward.

[Reference: PowerPoint Slide 14]

I urge you to share this information with your colleagues, with your friends and family, where concerned. These are reliable sources of information, where you can get it. I guarantee you, much of what you see on TV is either wrong or it's three days old if it's right.

We update this -- we may move now to just once a day updates on our website, because things are slowing down, but we will have current -- as current information as possible.

And with that, I thank you for your attention. I hope I didn't go too long, and I would gladly answer any questions you have.

CHAIRMAN HOWARD: Thank you, Paul. Commissioners, any questions? Commissioner Wright.

VICE CHAIRMAN WRIGHT: It's very good. Thank you, Paul. This morning I was listening, bouncing back between CNN and Fox and MSNBC and a couple of the reports were talking about the possible, I guess, meltdown or partial meltdown to where it may

have come through the primary containment vessel. Is that -- I have not seen that on any kind of a report, you know, in the last day or two. I just wondered where they're getting that information.

MR. GENOA: I don't know. I have seen -- we believe that fuel is damaged in Units 1, 2, and 3. Certainly, 1 and 3. We think the fuel may be damaged in the fuel pool of 4, possibly 3. When we say "damaged," it's probably overheated. The zirconium is oxidized. The heat has probably deformed the fuel. Probably the zirconium, when it's oxidized, in some cases would fail, because it actually acts as a barrier to radioactive gases that are in the fuel. So when you get that first release you're actually getting the radioactive gases, volatile things. That's why you hear about caesium and iodine and the temperature they volatilize.

What you're -- what people -- so there is fuel melting. So, I mean, we believe the fuel has been damaged, has melted. But this idea that the fuel would slump to the bottom and burn a hole through the eight-inch steel reactor vessel and then somehow melt through the concrete and go to China -- sort of the China Syndrome idea, -- you know,

really has been disproved. Now, you can end up with melted fuel at the bottom of the reactor. It changes the geometry of it. It makes it challenging to continue to cool it. We don't know -- I don't know that that's occurred.

Now, when they vented the individual reactors in 1, 2, and 3 to get that steam bubble out and the hydrogen went with it, it's -- and they certainly had radioactive gas there -- we don't know if the boiling was so energetic that you could have damaged fuel get pumped out of there as well, which would then accumulate in other parts of the containment. But it is in the containment, and I imagine the bulk of that will stay in there. The path for the radioactivity to get out is either as a gas or vapor, or in water if it's dissolved in water and if the water ends up getting out of containment as they keep flooding more and more.

VICE CHAIRMAN WRIGHT: When you say "containment" you're talking secondary containment?

MR. GENOA: No, primary. That yellow --

VICE CHAIRMAN WRIGHT: Primary?

MR. GENOA: -- primary containment.

VICE CHAIRMAN WRIGHT: Right. Okay. The fuel pools that -- and I don't understand why they are

so high, that kind of -- and that design.

MR. GENOA: That was an early design of BWRs, and it basically -- I suppose I could go back here to that picture [indicating].

[Reference: PowerPoint Slide 4]

The first plant I worked at was a boiling water reactor -- even an earlier design than this -- but you see at the top of that yellow [indicating].

VICE CHAIRMAN WRIGHT: Right.

MR. GENOA: That's what we call the reactor deck. And so when the reactor head -- because on a boiling water reactor, all of the instrumentation is on the bottom, and so you can take the reactor head off, and pull the fuel straight up through a transfer canister and drop it straight down into the pool. Now, these are very robust. I mean, there's several feet of concrete and it's steel-lined. You know, I really don't have accurate information on the structural status of the fuel pools in 3 and 4. We suspect they may be damaged, because they continue to put water into them, but the damage may be a fracture on one side, perhaps a tear in the liner that allows some leakage, but it's certainly not -- doesn't appear to be

something that would allow all the water to flow out.

VICE CHAIRMAN WRIGHT: Would the fuel pool be where some of the melting could be a real problem?

MR. GENOA: If Unit 4 exploded because of hydrogen, then one would have to assume that the water got below the fuel, the hydrogen was generated, and caused that explosion. So, yeah, we think fuel is damaged in 4.

VICE CHAIRMAN WRIGHT: The gentleman from NEI that was at the Nuclear Waste Strategy Coalition meeting day before yesterday maybe -- I'm trying to remember his name. Did a great, job by the way.

MR. GENOA: Tony Pietrangelo maybe?

VICE CHAIRMAN WRIGHT: Yeah, might have been.

MR. GENOA: It may have been Tony Pietrangelo. He's our chief nuclear officer.

VICE CHAIRMAN WRIGHT: He did a very good job. Thank you, Mr. Chairman.

MR. GENOA: But I think, maybe getting to your point, they're finding high levels of contaminated water in different levels of the plant. Some of it certainly could be coming from those fuel pools. That's what we're trying to understand.

VICE CHAIRMAN WRIGHT: Thank you.

CHAIRMAN HOWARD: Commissioners?

[No response]

Paul, I have a couple. What if it were another type of reactor, instead of a boiling water reactor? Would it have made any difference if the reactor were different?

MR. GENOA: I think that this is an event-driven situation and not a design-driven accident. So had they been pressurized water reactors there, they may have handled it differently, they may have been more robust, but they could have faced the same challenge if they had prolonged loss of power, totally.

Now, as I mentioned, the new plants that we're looking at, both boiling water from GE, and pressurized water from Westinghouse, that have passive safety features -- and I think some of you have heard about the small modular reactors that are under development today -- many of them have passive safety features. And what I mean by that is that, instead of having very active systems that require pumps and valves and electricity to move water around, they're designed so that water is pre-staged, allows gravity feed, that the design is such that natural convection with cold water

sinking and hot water rising would allow circulation and allow that to go forward. Both the Westinghouse AP1000 and GE ESBWR -- they're both going through licensing -- have passive safety features that will allow those plants to basically have no off-site or on-site power for 72 hours, by design, without a problem. And after that 72 hours, a very small pump that would fit -- you know, a little bigger than a lawnmower, could pump the water to keep that going almost indefinitely.

So we understand the loss of off-site power. We have backfitted existing plants to deal with it, we think successfully in this country, to face any challenge that we perceive, and we've designed new plants to try to totally eliminate that vulnerability.

CHAIRMAN HOWARD: We have in the United States, and I'm sure there are throughout the world, existing plants close to the coast. What kind of lessons can we learn or how can we prevent this happening if another tsunami hits -- and I'm convinced the tsunami caused the problem, not the earthquake.

MR. GENOA: Yeah.

CHAIRMAN HOWARD: If another tsunami hit in

some coastal region, what can be done after the plants are built to mitigate any damage or problems?

MR. GENOA: Well, again, plants that are in tsunami-prone areas are required to design for the most severe event that would be forecast for 10,000 years, and that's within 200 miles of that site. But if, in our analysis of the Fukushima accident, it turns out that we got it wrong or we didn't understand that phenomenon, then the NRC could either issue an order or change the requirement, and how you would address that might have to do with barriers. I'm not sure. But at first, I think it would be wrong to assume that you need to design a plant in a given location for an event that can only happen somewhere else. I mean, you know, tsunamis are pretty well understood. Earthquakes -- I won't get into any technical stuff, but this was a subduction level event. We don't have those in the Atlantic, I mean. So certain plants -- I mean, Diablo Canyon and San Onofre in California are the ones most people ask about. Early indications I saw were that their designs were about two and three times what the ground motion was in Japan. But, you know, we're

going to have to wait to actually get the information, but I don't think there's any need to immediately look out for change, until we understand what's going on -- other than the preparedness that we're already doing.

CHAIRMAN HOWARD: Thank you. I'm going to take some liberty. ORS, do you have any questions? Anyone from ORS? Jeff, I see you and Dr. Carlisle. Do you have any questions?

MR. NELSON: No, sir, Mr. Chairman. Thank you.

CHAIRMAN HOWARD: Since this subject, we do have a guest speaker -- generally, we don't allow the audience to ask questions, but I'm going to open up the questions for the audience. If any of you have any questions of Paul, would you please ask them? Dr. Spearman.

DR. SPEARMAN: Paul, you talked about the ground vibration. Now, everybody has this, basically, a Richter 9, and I guess we hear the Richter -- do we know what the ground movement was yet?

MR. GENOA: I have seen early indications, and I'm not sure I understand what they mean. It was like a .28, and I don't know what a .28 has to do

with, you know, acceleration of the ground. So I'm not qualified to actually answer.

But really smart people are looking at this really well, and they will have a better understanding. But we don't design to Richter Scale. We design to the actual ground motion. The Richter Scale has to do with sort of -- it's an order-of-magnitude measure of the seismic activity at the location of the epicenter, so where you are depends on how far you are from it, how it's transmitted to you, and what kind of geology you live on top of. And so a clay soil, versus a sandy soil, versus a rocky soil will have very different ground motions, and the plants are designed for those specific conditions. Every plant is designed for its own geology, its own soil characteristics, and for any event that is known within 200 miles of it, for seismic events.

DR. SPEARMAN: You mentioned San Onofre and Diablo Canyon about, you know, their design was for ground motion much higher than what we think occurred in Japan.

MR. GENOA: Yeah. I just saw those numbers early last week, and I -- so I don't have them in a table, but I saw a very quick reading that seemed

to indicate to me that the levels of San Onofre were about twice what was experienced, and Diablo was about three -- nearly three times. Now, that's preliminary, and I don't even know what the units are, so I -- it's ground acceleration, so it's probably meters per second squared, or something.

CHAIRMAN HOWARD: Any other questions?

MR. PATE: I've got one. Were you able to evaluate how the Japanese Government, or whoever was responsible for informing the public, went about doing that, and also in the NEI's planning -- NRC's planning, is public information a part of the same way that you have the engineering and your operations scenarios? Is that a part of that, too?

MR. GENOA: It is today; it wasn't before Three Mile Island. And that's a lot of our problem. Many people -- many of my friends and family -- obviously, I have a lot of concerned people and I spend a lot of my time talking to folks -- were angry that it seemed that the information coming from Japan was late, was inadequate, wasn't good enough. And the truth is, I shielded myself from CNN and the other news stations.

CHAIRMAN HOWARD: Paul, excuse me, I made a

technical error. Would you talk into the mike? And if anybody has a question, Jo's having a hard time picking it up. I apologize.

MR. GENOA: I'm sorry. Should I talk to you and answer it?

CHAIRMAN HOWARD: Talk to Jo but answer Jerry's question.

[Laughter]

MR. GENOA: So I would just say that my -- that we have gotten credible, consistent information from the Japanese Government and Japanese associations from day one, in the accident. We certain noticed confusion. There are confusions in the radiation measurements. Of course, we've never gone to the metric system; the rest of the world has, so that complicates the radiation measurements and other information. There's also a language barrier. I mean, for the first few days, we didn't hear the word "containment"; it was "container." You know, so, I mean, simple translation was challenging.

But I would argue that the Japanese Government appeared to do a fairly good job at what they needed to do. I'm not sure I'll give as high marks to our news media, that I believe scared a lot of

people unnecessarily. Not that this isn't serious, but, you know, you don't yell "Fire" in a movie theater, either, because people will take action and there could be unintended consequences to those actions.

But to this point, we do, in fact, have emergency plans at every site that include a communications function. There's actually an off-site emergency response organization and a facility already set up at every nuclear power site, where you can take senior-level executives and government officials, put them in the same room with all the phones, computers, capability, connection with the NRC, hotlines, so that you could get up-to-the-date information, make decisions, and disseminate that information by radio, television, and other communication tools. So every power plant has the capability to do that on site.

Coincidentally, NEI is an association; we don't have a responsibility to do any of those things, but we know that we will be expected to have that kind of information. Of course, after 9/11, we put together an emergency plan, we drilled it a few times. Fortunately, two or three weeks before this event, we drilled on our response and

we had all of our facilities up and running, and had just essentially dusted off our procedures and cleaned them up. So I would say that we probably did a much better job because of that planning than we might have done otherwise, and we are even better prepared today to go forward.

I will tell you, in addition, briefings like this, we have briefed over 500 people in Congress and their staff, governors, state legislators, the media, you know, everyone that we can, because it's important to get this information out -- as painful as it is to hear. But I would urge you to try to think of the big picture there, the real devastation and what the true impacts of this emergency are, in comparison.

Were there other questions?

COMMISSIONER WHITFIELD: Mr. Chairman.

CHAIRMAN HOWARD: Commissioner Whitfield.

COMMISSIONER WHITFIELD: Thank you, Mr. Chairman. Paul, if I could, I wanted to follow up on one or two questions. One involved the exchange you had with Commissioner Wright earlier about the spent fuel pool. I think from the conference calls and things we've had with your agency and various people, that spent fuel pool, the one Commissioner

Wright asked you about, where its location is in these old boiling water reactors, that really was just designed that way for closeness in proximity -- is that the right way of saying? -- just coming out of the steel containment vessel and just closeness in proximity, which are not used anymore; is that correct?

MR. GENOA: That is correct. It was the earlier General Electric designs that used an aboveground, above-grade fuel pool. It was likely for convenience to the way it was set up. Later plants -- most plants now have fuel pools that are at grade or below grade, so that even in the event of damage to the concrete and steel liner, they would be in the ground and would be difficult to lose their water inventory -- their cooling water inventory.

But even this pool, there are no valves, no drains. There is nothing below there to allow water out. And the issue of fuel pool safety has been evaluated over the years. The Nuclear Regulatory Commission actually chartered a study by the National Academy of Science -- this is early 2000s perhaps, 2002 maybe -- to look at the safety and security of spent fuel, in light of 9/11, in

light of everything we've learned, and they found that spent fuel was safe in US designs, either in the fuel pool, in the reactor, or in the cask, under a range of severe conditions. But again, you are correct that designs have moved away from the elevated fuel pool to one that is at grade or below.

COMMISSIONER WHITFIELD: My second question is, you had the -- all six reactors and you went down the scenario and had the status of what had occurred, what was going on I think with each of the six reactors over there. Of course, 5 and 6 are stable, you've got there. But the others, with what you have here and what's going on now, I realize you've got AC power back at the site and you're getting freshwater in there instead of the seawater. How long do you think the Japanese are going to continue -- what kind of timeframe will this continue?

MR. GENOA: I think we're still in emergency mode. In other words, they're still trying to deal with evolving conditions, degrading conditions, at the plant. They have power, but they don't have all the functionalities of the plants back yet. I think it will be weeks before they get full

stability in those systems and move into what I will call a recovery mode. So they're moving water around now. There's talk I heard today of using a spray that's been developed to help hold contamination to the ground and to the structure, so it doesn't blow away or wash away if it rains.

This is not over yet. So it is likely another few weeks before they fully secure everything and feel very confident that the situation is going to continue to improve and not get worse. That's still a chance now, but I have confidence in that. But after that, once they get into recovery, as I said, Units 1, 2, and 3 will not operate again. Now you may remember that Three Mile Island was a two-unit pressurized water reactor. And it actually, I believe, was Unit 2 that was damaged. Unit 1 -- I may be wrong with the unit numbers, but the other unit continues to work and has been working ever since, and actually has set records for performance. But it took several years to actually clean up the damaged reactor, get the fuel off-site, clean up all the water, decontaminate to the extent possible, and seal it so that it was secure from the environment. And at some point, it will have to be decommissioned.

I would imagine that it will be years for the Japanese to actually fully clean and take care of these reactors. It's a big problem, but it's one that, once they get the emergency under control, can be done in a very methodical way, with very little risk to the workers and very little risk to the public.

And yes, it's terrible they've destroyed, you know, three or four reactors, but in the scheme of the devastation, they've lost every other kind of power that was there, too. This is -- it's a tragedy.

COMMISSIONER WHITFIELD: Thank you.

CHAIRMAN HOWARD: Commissioner Wright.

VICE CHAIRMAN WRIGHT: I heard, I believe it was day before yesterday -- and maybe you can quote it exactly -- but I guess the point was being made about the safety record, I guess, and I believe it was in the United States, how many operational years that we have been operating reactors, and as it relates to people being hurt, and dying, or whatever, and it was remarkable just what, I guess, the gold standard that the United States has, working with the NRC and the other agencies out there and the industry policing itself. Do you

happen to know those numbers right off?

MR. GENOA: I can give you a few numbers. I may not know the exact ones that you were quoted. If you think about it, we have about 100 reactors and we've been operating about 50 years. So, I mean, if you start looking at that, it's, you know, 5,000 reactor years in operation. We have about the same number from the Navy; the Navy has about the same number of reactors. Other than an early fatality at a military reactor operated by the Army, there has never been a death due to radiation or radioactive material at a US nuclear facility -- commercial facility. The plant I worked at, Big Rock Point, initially -- I worked at several others -- it actually ran for 20 years without a single lost-time accident, so not even one person twisted an ankle in 20 years.

Our industrial safety record in the United States is second to no other industry. It's as safe to work at a nuclear plant as it is to work at a banking facility or a real estate office. So that's pretty safe.

Radiological safety, again, the exposures are controlled. The limits that we have, we don't approach, even although power plants are designed

to have liquid and gaseous releases to the environment under very controlled conditions, we often are orders of magnitude below those. So unlike other industries that sort of run right up against their limit, we know we're under scrutiny and we have to act in a different way, and it's pretty remarkable.

CHAIRMAN HOWARD: Any other questions?

[No response]

Paul, I personally want to thank you for coming and taking your time. We appreciate the valuable information you gave us today. Come back again. We look forward to hearing from you.

MR. GENOA: Thank you, Chairman Howard.

CHAIRMAN HOWARD: And we'll see you next Wednesday, April 6th at 2 o'clock. Thank you. Meeting adjourned.

[WHEREUPON, at 3:05 p.m., the commission meeting was adjourned.]

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